Report of a National Workshop on Screening for Cancer of the Cervix

Anthony B. Miller, MB, FRCPC; George Anderson, MB, FRCPC; Jacques Brisson, MD, Dsc; Jack Laidlaw, MD, PhD, FRCPC; Mrs. Nancy Le Pitre; Ms. Patricia Malcolmson; Patricia Nflrwaldt, MD, CCFP; Gavin Stuart, MD, FRCSC; Wayne Sullivan, MD

NOVEMBER 15.1991 *This report has not been peer reviewed.* REP D FROM CAN MED ASSOC J 199 1; *145 (10)*

SPECIAL SUPPLEMENT - SUPPLÉMENT SPÉCIAL

Report of a National Workshop on Screening for Cancer of the Cervix

Anthony B. Miller, MB, FRCPC; George Anderson, MB, FRCPC; Jacques Brisson, MD, DSc; Jack Laidlaw, MD, PhD, FRCPC; Mrs. Nancy Le Pitre; Ms. Patricia Malcolmsoii; Patricia Mirwaldt, MD, CCFP; Gavin Stuart, MD, FRCSC; Wayne Sullivan, MD

From the departments of Preventive ,Medicine and Biostatistics, University of Toronto, Toronto; Cytology, Cancer Control Agency of British Columbia, Vancouver; Médecine social et preventive, Université Laval, Quebec; Canadian Cancer, Society, Toronto; Preventive Health Services Division, Department of National Health and Welfare, Ottawa; Ministry of Health, Kingston, Ont.; University Health Services, Winnipeg; Tom Baker Cancer Centre, Calgary: Health and Fitness, Halifax.

Prepared by a writing committee, chaired by Dr. Anthony B. Miller, on behalf of the participants in the National Workshop on Screening for Cancer of the Cervix held in Ottawa, Ont., Nov. 27-29, 1989.

Other participants : Dr. Pierre Band, Cancer Control Agency of British Columbia; Dr. Connie Becker, Community Health Services, Winnipeg; Dr. Yvan Boivin, Hôpital Hôtel Dieu de Montreal, Montreal; Dr. Sharon K. Buehler, MEmorial University, St. John's; Dr. John A. Carmichael, Queen's University, Kingston, Ont.; Dr. E. Aileen Clarke, Ontario

102-05303/

Cancer Treatment and Research Foundation, Toronto; Dr. Marsha Cohen, University of Manitoba, Winnipeg; Mr. Edward Colford, Newfoundland Treatment and Research Foundation, St. John's; Dr. Douglas Cudmore, Hospital Health Services, Montague, PEI; Ms. Margaret Fitch, Toronto General Hospital; Dr. Robert C. Fraser, Victoria General Hospital, Halifax; Mr. Peter Hayles, Cancer Control Agency of British Columbia, Vancouver; Ms. Jessica Hill, Ministry Health. Toronto: Dr. Eric J. Holowaty, Ontario Cancer Treatment and Research Foundation, Toronto; Dr. Robin Hutchison, Hospital Programs Division, Victoria: Dr. Michel Joffres, Alberta Health, Edmonton; Dr. Alan Kwan, Newfoundland Cancer Treatment and Research Foundation, St. John's; Dr. Don Langille, Department of Health and Fitness, Truro, NS; Dr. Yang Mao, Cancer Section, Department of National Health and Welfare, Ottawa; Dr. Alexander Meisels, Hôpital Sainte Sacrement, Que.; Dr. Brenda Morrison, University of British Columbia, Vancouver; Ms. Cheryl Meyer, Canadian Cancer Society, Toronto; Dr. Grahame Owen, Oakville Health Center, Oakville, Ont.: Ms. Freda Palteil, Status of Women, Department of National Health and Welfare, Ottawa; Dr. Michel Pelletier, Ministry of Health and Social Services, Rimouski, Que.; Dr. David Penman, Medical Services Branch, Department of National Health and Welfare, Ottawa: Dr. Carolyn Pim, Department of Health, Yellowknife; Dr. Michel Roy, l'Hôtel Dieu de Québec, Quebec; Dr. Mary Scott, Department of Health and Community Services, Fredericton; Dr. Carol Scurfield, Women's Health Clinic, Winnipeg; Dr. Carol Smillie, Dalhousie University, Halifax,- Dr. May Smith, Health Services and Promotion Branch, Department of National Health and Welfare, Ottawa; Dr. Sylvie Stachenko, Health Services and Promotion Branch, Department of National Health and Welfare, Ottawa; Dr. Donald W. Thompson, Banting Institute, Toronto; Dr. Roy West, Saskatchewan Health, Regina; Dr. Donald T. Wigle, Health Protection Branch, Department of National Health and Welfare, Ottawa; Dr. Gordon Winsor, Department of Health, St. John's

Supported by the Canadian Cancer Society, the Department of National Health and Welfare and the National Cancer Institute of Canada.

Correspondence to: Dr. Anthony B. Miller. Department of Preventive Medicine and Biostatistics, University of Toronto, Toronto, ON M5S IA8

Screening for cancer of the cervix with effective use of cervical cytology smears reduces the incidence and mortality of the disease. However, the programs in Canada are not fully effective: not all women at risk are being screened; some physicians have not acquired the necessary skill to take satisfactory smears; some laboratories are too small to provide adequate experience for staff and effective quality control; and some women with detected cytologic abnormalities of the cervix are receiving inadequate follow up and management. Conversely, cytologically normal women tend to be screened too frequently, which is an inappropriate use of resources.

The workshop's recommendations are designed to ensure the introduction of organized programs of cervical cancer screening in Canada. We propose provincial, population-based

information systems to ensure that women over age 18 who are or have been sexually active are invited to be screened and will return every 3 years until age 70. Regional or central laboratories for cervical cytology, with adequate quality control, should become the standard for examination of cervical smears. Facilities for colposcopically directed diagnosis and therapy for women with preclinical abnormalities should be available. Mechanisms for monitoring and evaluating the program need to be introduced in each province. We believe that the introduction of organized programs in each province will not lead to an increase in the total costs for cervical cancer screening because the savings derived from less frequent screening of cytologically normal women could be redirected to introducing the recommended information system and upgrading laboratory and management facilities.

Until the organized systems for cervical cancer screening recommended in this report are established, physicians should ensure that cervical cytology smears are taken soon after age 18 or once women are sexually active. The process should be repeated after I year and,. provided the smears are of appropriate quality and normal, at least every 3 years until the woman reaches age 70. This will ensure that as many women as possible throughout Canada are offered the protection that regular cervical cytologic screening provides.

Recommendations

The following recommendations should be considered as a whole. The screening frequencies should be established formally only when the following are in place: high-quality laboratory services for reading cytology smears, with adequate internal and external quality control systems, and information systems to monitor screening frequencies and to issue reminders to attend at the recommended intervals.

Not all jurisdictions will be able to implement all the recommendations rapidly, but this should not prevent them from complying with those recommendations with which they can, when they can. The following are listed in the order in which they appear in this report. The rationale for each recommendation is outlined in the main report.

An organized approach

1. Governments should encourage and support development or enhancement of organized cervical cytology screening programs involving family physicians, specialists, laboratories and information systems to reduce morbidity and mortality from carcinoma of the cervix (see page 1305).

2. All women age 18 and over who have had sexual intercourse should be encouraged to participate in a cervical cytology screening program (see page 1306).

3. Care should be taken to incorporate new programs within an overall conceptual and planning framework of care of well women (see page 1306).

4. The setting and manner of screening for cervical cancer should be sensitive, supportive and culturally appropriate (see page 1306).

5. Concepts of cervical cancer prevention and screening should be integrated with sex education for students and included in health promotion programs directed to all adolescents (see page 1306).

Frequency of screening

6. A second smear should, in general, be taken after 1 year, especially for women who begin screening after age 20 (see page 1307).

7. If the first two smears are satisfactory and show no significant epithelia] abnormality, women should, in general, be advised to be rescreened every 3 years to age 69 (see page 1307).

8. Women over age 69 who have had at least two satisfactory smears and no significant epithelial abnormality in the last 9 years and who have never had biopsy-confirmed severe dysplasia or carcinoma in situ (cervical intraepithelial neoplasia [CIN] III) can be dropped from the cervical cytology screening program (see page 1307).

9. The recommended frequency of rescreening for women age 18 to 69 is appropriate for all risk groups (see page 1307).

10. Women entering a screening program at age 67 or older should have two satisfactory smears at least 6 months apart; those over age 69 can then be dropped from the program if the smears show no epithelial abnormality (see page 1308).

11. The recommended screening frequencies apply to women whose smears show no epithelial abnormality. If abnormalities are detected, schedules for repeat examinations should be dictated by the requirements of surveillance, diagnosis, treatment and follow up (see page 1308).

12. Women do not need to be screened if they have never had sexual intercourse or have had a hysterectomy for benign conditions with adequate pathological documentation that the cervical epithelium has been totally removed and previous smears have been normal (see page 1308).

Management of abnormalities

13. In women with cytologic abnormalities the degree of abnormality reported by the cytopathologist should be noted (see page 1309).

(a) Generally, a repeat cytology smear should be recommended in 6 months for women with

cytologic evidence of mild dysplasia (CIN I) with or without human papillomavirus (HPV) effects. If there is no evidence of cytologic progression, repeat smears at 6-month intervals are appropriate for up to 2 years, after which colposcopy should be arranged for all women with persistent abnormalities (see page 1309).

(b) Referral for colposcopy should be arranged for women with cytologic evidence of moderate or severe dysplasia (CIN II or III) or malignant cells (see page 1309).

14. Colposcopy should be performed by adequately trained gynecologists or other health professionals who work in a setting that provides a constant source of abnormal material so that their skills can be maintained and enhanced (see page 1309).

15. Women who have been treated for an epithelial abnormality of the cervix, or have had an epithelial abnormality that regressed spontaneously with no epithelial abnormality on two consecutive follow-up visits, should be rescreened annually for as long as is clinically feasible (see page 1310).

Information systems

16. Information systems should be established in all provinces to ensure appropriate organization of all programs (see page 1311).

17. There should be consultation with all appropriate interests before establishing information systems. The design of information systems should be a result of participatory planning involving all the stakeholders (see page 1311).

18. Before the system is made operational all stakeholders should be consulted on policy about access to data and the conditions under which identified data can be released. The use of information systems should be compatible with the database requirements in the province (see page 1311).

19. Agreement on the core data to be included in information systems should be sought among all jurisdictions (see page 131 1).

Training and quality control requirements

20. Cytotechnologists should be trained according to the requirements of the Canadian Medical Association's Conjoint Committee on the Accreditation of Educational Programs in Cytotechnology or their equivalent, as recognized by the Canadian Society of Laboratory Technologists (see page 1312).

21. For most efficient function in a mass screening program a laboratory should process a sufficient number of cases annually to require staffing by a minimum of three qualified and experienced fulltime cytotechnologists, supervised by a cytopathologist, plus adequate

clerical and technical support staff (see page 1312).

22. Provincial governments should recognize the need for centralization or regionalization of cervical cytology screening services wherever there are multiple laboratories not fulfilling the criteria set out in recommendation 21 (see page 1313).

23. The jurisdiction responsible for cervical cytology screening programs should ensure that appropriate and satisfactorily functioning quality control mechanisms are in place (see page 1313).

Other considerations

24. The jurisdictions responsible for cervical cytology screening programs should ensure that the mechanisms described in this report are in place to evaluate and monitor the total program, which should be overseen by a broad-based advisory committee established by each province (see page 1314).

25. When new data on duration of protection from negative smears at ages 60 to 69 are available, the recommendation to continue screening to age 69 should be reconsidered (see page 1314).

26. Current evidence is not sufficient to support the use, in screening for cervical cancer, of laboratory procedures designed to detect specifically the presence of HPV (see page 1317).

27. No later than 1996, all programs should be reviewed further for the Conference of Deputy Ministers of Health using data obtained through the evaluation and monitoring functions of the recommended information systems (see page 1317).

Introduction

Screening for cancer of the cervix is a recognized component of cancer control.[1] In Canada it began in British Columbia in 1949 and gradually spread across the country. In 1976 the Task Force on Cervical Cancer Screening Programs[2] recommended that "health authorities encourage and support the development of cytologic screening programs designed to detect the precursors of clinical invasive carcinoma of the cervix." This recommendation was reaffirmed by the reconvened task force,[3] but there is little evidence of any major changes in the organization of cervical cancer screening programs, perhaps because major stakeholders were not directly involved in the discussions. Cervical cancer is still an important cause of morbidity and mortality in Canada, and incidence and mortality rates are no longer declining, especially in younger women. In 1990 an estimated 1300 newly diagnosed invasive cancers of the cervix and 380 deaths in Canada were expected.[4] Although better than if there were no screening, both totals are probably at least twice as high as they would be with more effective programs. Most deaths occur in unscreened or poorly screened or

managed women. Furthermore, the annual direct and indirect cost of invasive and fatal cancer of the cervix in Canada is $180 to $270 million. It is important not only to prevent unnecessary disease and death in women but also to use health resources effectively.

What age to begin and stop screening in a woman and how often to screen are controversial questions. Although the first task force[2] recommended screening every 3 years until age 35 for all at-risk women not believed to be at high risk, the reconvened task force[3] recommended annual screening until age 35 because it regarded most young Canadian women to be at high risk. Effective organized screening programs for cervical cancer in the Nordic countries are based on screening every 2 (in Iceland) to 5 (in Finland) years.[1] Annual testing is controversial because it wastes resources that could be used to screen high-risk women, although the United States has recently moved toward recommending annual screening.[5] As a workshop group on the introduction of organized screening for breast cancer reported,[6] elements in Canada exist to permit introduction of organized screening programs. Therefore, sponsoring agencies agreed to try to achieve consensus on the necessary steps to make Canadian programs more efficient and effective.

The National Workshop on Screening for Cancer of the Cervix was planned with the following general goal and specific objectives.

Goal

To further the development of an efficient, comprehensive system for screening for cancer of the cervix in Canada to reduce the disease's incidence and mortality.

Objectives

- To review available information on the cause and natural history of cervical cancer and to assess its implications on policies for screening for the disease.

- To review prior Canadian recommendations on screening for cervical cancer-, to assess current Canadian approaches for detecting, diagnosing and managing precancerous cervical abnormalities; and to propose an integrated program for screening for cervical cancer within Canada's health care system.

- To consider and report on the policy and financial implications of revised recommendations for screening for cervical cancer.

History

How often to screen and at what age to begin and terminate screening depend on our

understanding of the natural history of precancerous states of the cervix. Although a few studies have followed up women to determine the probability of progression or regression of biopsied abnormalities,[7] they have generally been considered to be unethical; in any case, the process of diagnosis may have affected the natural history. Therefore, we must depend on inferences from the follow up of women with cytologic abnormalities and study, preferably longitudinally, the incidence and prevalence of well-characterized lesions in a defined population.[8]

Previous studies suggest that precancerous cervical abnormalities, even carcinoma in situ, most likely regress.[8,9] However, there is still doubt about the propensity of milder forms of dysplasia to become cancerous and the natural history of the disease in younger birth cohorts. Two recent Canadian studies have addressed these issues. In the first the propensity for lesions with different degrees of dysplasia to progress was assessed in a large Toronto laboratory that had a long history of uniform classification of cytologic abnormalities.[10] A sample of 176 808 smears was constructed for the years 1962 through 1981. All those with a cytological diagnosis of dysplasia or worse plus a random sample of 3% of all records were examined. The prevalence of dysplasia rose during the study period. The relative risks for carcinoma in situ or worse in a subsequent smear were greatest for those with severe dysplasia, intermediate for those with moderate dysplasia and low for those with mild dysplasia. Most women with mild dysplasia had normal smears at the next smear. Thus, the risk of progression is related to the degree of dysplasia, and most cases of mild dysplasia are likely to regress spontaneously.

The second study, an extension of the British Columbia cohort study to 1985, explored the natural history of disease in relatively young women born between 1944 and 1948 (cohort 3).[11] The originally studied birth cohorts born between 1914 and 1918 (cohort 1) and 1929 and 1933 (cohort 2) had their follow up extended from 1969 to 1985. The analysis concentrated primarily on prevalence and incidence of dysplasia and carcinoma in situ and incidence of invasive cancer in the three cohorts. For dysplasia there is evidence of a major diagnostic bias, introduced by the provincial colposcopy program in the 1970s, that affects all three birth cohorts, but mostly the youngest (cohort 3). There is no evidence that this major increase in diagnosis of presumed precursors had any effect on the incidence of carcinoma in situ or invasive cancer. The incidence of invasive cervical carcinoma was lower at comparable ages for cohort 2 than for cohort I and similar for cohorts 2 and 3. Thus, there is no indication that rescreening should be more frequent for younger than for older birth cohorts. For all cohorts combined, a negative smear had a substantial protective effect for 5 years, even more if there had been two negative smears. Cohort 3 provides relevant data about when to start screening; although the incidence of invasive cancer was low at ages 20 to 24, that for carcinoma in situ was already appreciable, thus supporting recommendations to start screening by age 20. Cohort 1 provides relevant data about what age to stop screening; appreciable rates of invasive cancer were found at ages 60 to 64 and 65 to 69 in women previously screened.

Effectiveness

Several reviews, including those of the Canadian task forces on screening for cancer of the cervix,[1-3] have concluded that screening effectively reduces the incidence and mortality from the disease. Three types of studies provided evidence. First, correlational studies have shown a strong association between reduction in mortality from cervical cancer and intensity of screening.[12,13] Second, comparisons among the Nordic countries demonstrated a marked reduction in incidence and mortality from the disease, particularly in Iceland and Finland,, with organized screening programs based on 2- and 5-year screening, respectively, but not in Norway, which had not introduced such a program.[14,15] These results contrast greatly with trends in Canada, which have been much more gradual than in Finland or Iceland and show no particular time when screening had made a major impact on the disease. The failure of unorganized programs to make a major impact on the incidence and mortality from the disease has been documented in the United Kingdom.[16,17] Third, case-control studies in many settings have shown that patients with the disease had far less screening than controls drawn from the same population, with a relative risk of cervical cancer for those with no smears in the last 5 years compared to those who had a negative smear of about 3.[18-23]

A study by the International Agency for Research on Cancer, based on the records of several screening programs in Europe and Canada, showed that one or, preferably, two negative smears are followed by low risk for at least 5 years.[24] The findings were used to estimate the optimal frequency of rescreening. Starting screening at age 25 and continuing at 3-year intervals until age 64 gives 90% of maximal protection and only requires 13 tests in a lifetime. Screening starting at age 20, with annual screens, gives only just over 90% protection, yet requires 45 tests in a lifetime. Thus, the marginal yield from annual screening is minimal. Although no randomized controlled trials of screening for cervical cancer have been conducted, the observed evidence has been accepted as conclusive. The task is now to ensure establishment of the necessary organization to achieve maximal efficiency and effectiveness of screening.

The Workshop Group concludes that organized programs of screening for carcinoma of the cervix are effective in reducing the incidence and mortality from the disease and recommends the following:

Recommendation 1. Governments should encourage and support development or enhancement of organized cervical cytology screening programs involving family physicians, specialists, laboratories and information systems to reduce morbidity and mortality from carcinoma of the cervix.

Components

Recruitment of women

Until now women in Canada have been recruited into screening programs by a physician or because an informed woman has requested that a smear be done. Family physicians and gynecologists who have primarily been responsible for cervical cytology screening have tended to rely on the opportunities to initiate screening offered by premarital examinations, antenatal and postnatal care and prescription of oral contraceptives. In addition, college and university medical services and family planning clinics have invariably offered screening to their clients. As well, the annual medical examination recommended by many physicians has encouraged continuation of regular screening for some women. This relatively laissez-faire approach has been moderately successful in a province such as British Columbia, where a central authority encourages screening through professional and public education, but it has been far less successful elsewhere in Canada. Such an approach tends to concentrate on normal-risk women and excludes recent migrants, native women and most high-risk women, especially those past childbearing age but approaching the age when cervical cancer becomes most common.

The service must examine the needs of ethnocultural populations and other community factors. such as age distribution, socioeconomic status, migration and immigration history, geographic distribution, general demographics and education levels. All these issues will influence how the service reaches the population at risk.

The Workshop Group hopes that its first recommendation will result in the introduction of the appropriate organization in each Canadian province to ensure, as far as possible, inclusion of all eligible women in cervical cytology screening programs.

Age to initiate screening

The previous task forces concluded that all women who have been sexually active are at risk for cervical cancer and therefore eligible to enter a screening program.[2,3] Nevertheless, invasive cervical cancer probably does not develop instantaneously, and there is a latent period of many years before detectable preclinical disease occurs. The Workshop Group has assumed that no invasive disease will occur in a women within 3 years of initiating sexual activity. Other countries have made similar assumptions and recommended that initiation of screening be delayed until age 25.[1] However, British Columbia's data indicate a substantial prevalence of preclinical disease in women age 20 to 25. The Workshop Group recommends the following:

Recommendation 2. All women age 18 and over who have had sexual intercourse should be encouraged to participate in a cervical cytology screening program.

There are three ways to achieve this objective: public education campaigns to ensure that women request screening; professional education campaigns to ensure that physicians include their patients in screening; and an organized program combining these two elements

with a program that ensures that women are invited to be screened. The first two programs have been used in Canada and clearly have been insufficient. It is not at all clear that they have been targeted to those who need the information most; special efforts may be needed to bring many at-risk women into screening programs.

Although we greatly favour the introduction of organized programs for cervical cancer screening in Canada, not all women at risk necessarily respond to invitations to be screened, especially if they have had bad experiences with the medical care system. As well, many high-risk women have other health, social or economic problems that may cause them to rank the immediate need to be screened very low. Hence, a coordinated program of health promotion is essential to ensure that eligible women are screened. How best to recruit women may also necessitate research (see below, Research needs). Health promotion strategies should be client centered and culturally sensitive - for instance, to native groups and recent immigrants. In designing these approaches, women, health care providers, community leaders and other relevant and knowledgeable people in areas such as housing and education are key participants. The Workshop Group recommends the following:

Recommendation 3. Care should be taken to incorporate new programs within an overall conceptual and planning framework of care of well women.

Recommendation 4. The setting and manner of screening for cervical cancer should be sensitive, supportive and culturally appropriate.

In addition, all adolescent men should be provided with information on cervical cancer and on their role in preventing the disease and in encouraging their partner to be screened. The information should be supplied early enough to have an impact on their behaviour. The Workshop Group recommends the following:

Recommendation 5. Concepts of cervical cancer prevention and screening should be integrated with sex education for students of both sexes and included in health promotion programs directed to all adolescents.

Frequency of rescreening

It has already been explained why the Workshop Group concluded that the benefits of screening annually are little better than those of screening triennially, provided there is an organized system comprising all appropriate aspects of screening, especially good laboratory services and a population based information system. This applies to women of all ages because international data and recent data from British Columbia indicate that, after a negative result, development of invasive cancer is unlikely within the next 5 years; that is, the concern that led the reconvened task force[3] to recommend annual smears until age 35 has been proved groundless.

Concern about the high false-negative rate is legitimate, especially when smears are

examined in questionably adequate laboratories. Errors in taking the smear, plus laboratory errors even in a high-quality laboratory, result in a false-negative rate of about 25%.[8] Protection is considerably enhanced when there have been two consecutive negative results. Given the low probability that preclinical disease will develop in very young women, these considerations apply in practice only to women entering a screening program after age 20. The Workshop Group recommends the following:

Recommendation 6. A second smear should, in general, be taken after I year, especially for women who begin screening after age 20.

Both task forces recommended screening every 5 years after age 35, on the basis of the assumption that nearly all detectable preclinical disease would have occurred by then.[2,3] Recent studies tend to confirm that preclinical disease does appear after age 35, and screening only every 5 years may not be appropriate for women entering a program relatively late. Changing the frequency of rescreening at age 35 conflicts with other countries' recommendations and with our belief that recommendations should be as clear and concise as possible. A reasonable compromise is to recommend regular screening every 3 years throughout a woman's screening period.

The age to stop screening

Both task forces recommended that women over age 60 who have had repeatedly satisfactory cervical smears be dropped from a screening program.[2,3] The recent data from British Columbia show that invasive cancer may still occur in women over the age of 60 who had negative results previously. This reinforces clinical experience and some people's belief that there should not be an upper age limit to screening for cervical cancer. Screening for cancer of the cervix among women over the age of 65 in the United States is now covered by Medicare and is thought to be cost effective.[25] Nevertheless, as with any disease with a long natural history, protection for women who have always had negative screening results will persist for many years after screening stops. It is not necessary to continue screening through the 70s and 80s. The Workshop Group recommends the following:

Recommendation 7. If the first two smears are satisfactory and show no significant epithelial abnormality, women should, in general, be advised to be rescreened every 3 years to age 69.

Recommendation 8. Women over age 69 who have had at least two satisfactory normal smears and no significant epithelial abnormality in the last 9 years and who have never had biopsy-confirmed severe dysplasia or carcinoma in situ (cervical intraepithelia] neoplasia [CIN] III) can be dropped from the cervical cytology screening program.

High-risk women

Cervical cancer is strongly associated with first intercourse at an early age and multiple

sexual partners in both men and women, which supports the theory that a sexually transmitted agent is the principal cause of the disease. Other factors include parity, cigarette smoking and use of oral contraceptives. These risk factors tend to be associated with carcinoma in situ and more advanced stages of dysplasia. The impact of these factors has been fully discussed.[2,3]

The concept that women at high risk for cervical cancer should be screened more frequently than women at "normal" risk underlies some recommendations of both task forces.[2,3] However, there is no evidence that the disease progresses more rapidly in high-risk women than in other women.[26] Truly highrisk women have preclinical abnormalities, and the goal of screening is to identify and place these women under special surveillance. Therefore,, it is not necessary to recommend a different screening frequency for women who are labelled high risk for some other reason. The Workshop Group recommends the following:

Recommendation 9. The recommended frequency of rescreening for women age 18 to 69 is appropriate for all risk groups.

Late entrants

With introduction of an organized program directed to all women of at-risk age, many older women who have not been screened will be recruited. If the program is to have a rapid impact, these women should be a high priority because most invasive cancer occurs at older ages and in women not previously screened. If a woman is first recruited into screening in her 60s, absence of a detectable abnormality is reassurance that she is not at high risk. Although the problem of false-negative results is potentially more critical at older than at younger ages, this is at least partly covered by recommendation 6. A second smear I year later may not eliminate all false-negative results in older women. Thus, a woman starting screening in her late 60s must have at least two normal smears before she is dropped from the program. The Workshop Group recommends the following:

Recommendation 10. Women entering a screening program at age 67 or older should have two satisfactory smears at least 6 months apart; those over age 69 can be dropped from the program if the smears show no epithelial abnormality.

Women over age 69 who have never been screened are likely to resist any attempt to include them in a routine system and should be dealt with individually. If the opportunity to screen such women occurs, a smear should be taken. If the result is negative another smear at least 6 months later would be appropriate. However, the Workshop Group recognized that this is a matter of clinical judgement and agreed that specific recommendations would not be appropriate.

Other considerations

The Workshop Group agreed that it must reemphasize that its recommendations on screening frequency apply only to women who have no detectable abnormality. The Workshop Group recommends the following:

Recommendation 11. The recommended screening frequencies apply to women whose smears show no epithelia] abnormality. If abnormalities are detected, schedules for repeat examinations should be dictated by the requirements of surveillance, diagnosis, treatment and follow up.

Both task forces identified some categories of women who need not be included in a screening program because they are not at risk of the disease.[2,3] The Workshop Group concurs with their recommendation as follows:

Recommendation 12. Women do not need to be screened if they have never had sexual intercourse or have had a hysterectomy for benign conditions with adequate pathological documentation that the cervical epithelium has been totally removed and previous smears have been normal.

Taking smears

Inappropriate sampling methods are responsible for about two-thirds of false-negative results. Health professionals must be adequately trained in how to take the smear, place it on a slide and fix it. Appropriate sampling techniques for obtaining adequate Papanicolaou smears have been well described.[27] The reconvened task force report provides a more detailed discussion of the "adequate cervicovaginal" smear.[3]

The smear should always be taken with a spatula after visual examination of the cervix with a speculum; any observed clinical abnormality dictates that the woman must be referred for diagnostic evaluation no matter what the result of the smear. When a smear is being taken directly from the cervix with a spatula, the spatula should be rotated 360° with firm contact, ending in the horizontal position (3 and 9 o'clock). The sample should be on the upper surface of the spatula during transfer.[27]

The woman must be comfortable during the examination, which should be performed in a warm room with a warm speculum. The woman's head should be raised so that she can see the examiner and the equipment. She should be mostly covered and should be able to talk and ask questions during the procedure. Medical students should receive adequate training in the taking of smears.

Reading and interpreting smears

Smears should be read only by qualified cytotechnologists and should be interpreted in consultation with cytopathologists. Criteria for laboratories and the training of

cytotechnologists and cytopathologists are described below (see A supporting laboratory network).

Reporting results

Smears should be "signed out" by the laboratory director or designate, who must be satisfied that appropriate quality control systems are in place (see below, Quality assurance programs). The time between taking the smear and issuing the report should be as short as feasible so that if an abnormality is detected it can be managed appropriately.

The recommended terminology for reporting results originated from the task force[2] and was revised by the Canadian Society of Cytology. Although other terminology is in use or has been recommended,[28] it involves some "compression" of information. The Workshop Group prefers a more detailed report with appropriate management recommendations for the woman's physician. At the same time, information should be sent to the woman either a simple confirmation of normal findings with recall at the recommended interval or, if the smear is abnormal, a request that she see her physician. The recommended terminology for cervicovaginal cytology is listed in Appendix 1.

Management of women with abnormal smears

Cytologic screening is designed to detect preclinical cervical dysplasia or neoplasia. Such abnormalities may be reported in different ways but all are encompassed in the term "abnormal," meaning the smear shows atypical epithelial cells. Women with normal smears, (i.e., no atypical cells) should be screened again at the recommended intervals. Women with an abnormal smear are removed from the screening program and require active management. The person obtaining the smear must ensure that appropriate follow-up action is taken.

Repeat cytology

A technically unsatisfactory initial smear should be repeated in 6 months unless there is clinical evidence of a cervical lesion. The absence of endocervical cells or squamous metaplastic cells in patients under age 48 suggests that the smear may be suboptimal and may not have been taken from the transformation zone of the cervix. This should be reported to the patient's physician with the recommendation that another smear be done at 12 months, provided the patient's previous smears have been normal.

Repeat cytology is appropriate for most women with smears that are abnormal but lack definite cytologic evidence of neoplasia. Women with abnormal cells consistent with benign atypia (nondysplastic) or mild dysplasia (CIN I) or HPV infection, with or without mild dysplasia, should be advised to have a repeat smear within 6 to 12 months. If there is still evidence of an abnormality, but it is not more severe, the smear can be repeated up to 24

months after the first diagnosis of abnormality. If the abnormality persists or has progressed. the woman should be referred for colposcopy.

Women with moderate or severe dysplasia (CIN II or III), with or without evidence of HPV infection, should be referred at once for colposcopy, although in British Columbia at least, women with abnormal cells consistent with moderate dysplasia are rescreened before referral. Elsewhere this is not considered advisable because of uncertainty about the appropriateness of the cytologic diagnosis in determining management. The Workshop Group recommends the following:

Recommendation 13. In women with cytologic abnormalities the degree of abnormality reported by the cytopathologist should be noted.

(a) Generally, a repeat cytology smear should be recommended in 6 months for women with cytologic evidence of mild dysplasia (CIN I) with or without HPV effects. If there is no evidence of cytologic progression, repeat smears at 6-month intervals are appropriate for up to 2 years, after which colposcopy should be arranged for all women with persistent abnormalities.

(b) Referral to colposcopy should be arranged for women with cytologic evidence of moderate or severe dysplasia (CIN II or III) or malignant cells.

Colposcopy

Colposcopy is not a screening tool; it is a diagnostic technique that may help establish the specific diagnosis in women reported to have an abnormal smear. Colposcopy should be performed only by qualified people. Colposcopy enables the examiner to select the cervical site that should be biopsied for histopathologic review. Appropriate management is recommended on the basis of the histologic diagnosis.

In Canada colposcopy should be coordinated provincially. It is important that these services be delivered in a university teaching centre, a regional cancer clinic facility or a designated hospital to ensure that only appropriately trained personnel, who have been exposed to a sufficient volume of clinical material to maintain expertise, are practising diagnostic colposcopy. The Workshop Group recommends the following:

Recommendation 14. Colposcopy should be performed by adequately trained gynecologists or other health professionals who work in a setting that provides a constant source of abnormal material so that their skills can be maintained and enhanced.

Provincial coordination of colposcopy facilities will allow quality control programs to include colposcopy, cytology, histology, reporting and follow up. Ideally this program would be linked directly to the provincial information system for the cervical cytology screening program.

Use of colposcopy in this way avoids the use of diagnostic cervical cone biopsy in most patients. Diagnostic cone biopsy is still warranted if the colposcopic examination is unsatisfactory (i.e., if the squamocolumnar junction is not visualized or if the limits of the lesion are not seen), if the histology report identifies microinvasive carcinoma on directed biopsy, if the endocervical canal contains disease or if the colposcopic examination does not identify a lesion consistent with that described in the cytology report. This limited use of diagnostic cone biopsy will minimize the inherent operative morbidity of the procedure and reduce the potentially adverse effect on future pregnancies.

If the colposcopic evaluation fails to reveal significant disease on two visits 6 months apart the patient may be advised to return to the regular screening intervals.

Management and treatment

If a cervical lesion is detected at the time of the smear, a tissue biopsy is warranted regardless of the cytologic report.

If moderate or severe dysplasia or carcinoma in situ (CIN II or III) is diagnosed, treatment is advisable. Acceptable treatment may be electrocauterization, cryosurgery, laser therapy, therapeutic conization or hysterectomy, depending on the patient's age, her desire for additional children, how likely she is to comply with follow-up instructions, other medical or surgical disease, and the extent of the lesion. Experts do not totally agree on the best form of therapy for all patients, but treatment should be individualized.

Diagnosis of microinvasive carcinoma warrants a total hysterectomy in most instances. In some patients conservative therapy with a cone biopsy may be considered. Invasive cancer requires specific investigation and management in consultation with a gynecologic oncology service. Occult invasive cancer is usually managed with either radiation therapy or a radical hysterectomy and pelvic lymphadenectomy.

Follow up

A patient who has been treated for cervical neoplasia should never return to the screening intervals recommended for women without any diagnosed abnormality. If the treatment was for intraepithelial disease, the Workshop Group recommends two repeat evaluations with cytology and colposcopic assessment at 6-month intervals. If these two evaluations yield negative results for persistent or recurrent disease, annual cervical cytology should be performed. If the treatment was for invasive cancer, follow up according to the cancer centre guidelines is appropriate. Therefore, the Workshop Group recommends the following:

Recommendation 15. Women who have been treated for an epithelia] abnormality of the cervix, or have had an epithelial abnormality that regressed spontaneously with no epithelial abnormality on two consecutive follow-up visits, should be rescreened annually for as long

as is clinically feasible.

Reasons for failure

Any woman in whom invasive cervical cancer develops, particularly who dies from the disease, represents a failure of the system. Such patients fall into one of four categories: those who have never been screened; those who were screened many years ago, but not within the previous 5 or 10 years; those who have been screened within 5 years but not managed appropriately; those in whom the disease progressed too rapidly to be influenced by screening. The last category is rare but presumably exists, contributing to the residual 10% of invasive cancers not benefited by screenings.[24] In one study, invasive carcinoma of the cervix developed in 245 women: 61 % had never been screened; 11 % had a screening history considered to be unsatisfactory; and 29% had a screening history considered to be adequate.[29] However, 71% of those with adequate screening had abnormal cytologic findings, and most had no further evaluation for 6 months or longer. Several had repeatedly abnormal smears, but no action was taken.[29] The failures of the process should be reduced by an organized system; indeed, their reduction is a main justification for the information system described below. Other faults in the process should be reduced by the Workshop Group's recommendations for management of abnormal smears and for more efficient laboratories. Failures usually result from errors in taking or reading smears, which lead to false-negative results and failure to ensure appropriate management for women with abnormal smears.

Organization

Effective organization is the key to the success of any screening program, especially when its goal is to reach a large and geographically dispersed population. Organized and accurate information is also important because the program must be culturally sensitive, and test results must be communicated quickly. Efficient delivery of treatment and follow up are vital, and the data must be available to monitor and evaluate the program and to make interprovincial comparisons.

Five major organizational elements are proposed for cervical cancer screening programs: (a) a population-based information system; (b) a supporting laboratory network; (c) quality assurance programs; (d) methods for monitoring and evaluation; and (e) health promotion.

The first four of these are described below. Health promotion relevant to screening for cervical cancer - recruitment of women, education of women, outreach and education of health professionals are described elsewhere in this report.

Population-based information systems

A population-based information system is the foundation of organized screening programs.

It must be able to support diverse goals (Appendix 2), including retrieval of individual pieces of information and sophisticated, aggregate and comparative analyses of data.

Information systems are important because they can fulfil a broad range of goals. Information systems for cervical cancer screening programs must be able to:

- identify the target population

- identify individual women in the target population

- facilitate preparation of letters to remind women to attend for screening once they reach age 18, to reattend for screening at the recommended intervals and request that they visit their physician if an abnormality is discovered

- determine whether action has been taken by the woman and her physician if a cytologic abnormality has been discovered

- provide long-term follow up for patients who have received treatment

- provide data on a woman's previous screening history to her physician

- collect data to assess the efficiency of laboratory quality control systems

- permit evaluation and monitoring of the total system

- permit the comparison of data interprovincially, nationally and internationally

Therefore, the Workshop Group recommends the following:

Recommendation 16. Information systems should be established in all provinces to ensure appropriate organization of all programs.

Development of information systems will be facilitated by the introduction of permanent, individual health care identifiers (numbers) but need not depend on them and should not be delayed because unique identifiers arc not yet in use.

Information system design

The design of an information system should not be relegated solely to systems experts,, it must incorporate the views and information needs of all groups involved in the program. Wide-range consultation and participatory planning are essential lest opportunities be missed to structure the system so that it can serve ongoing needs. For example, consumer advocates might want data about screening facilities (location, hours, wheelchair accessibility and linguistic capabilities), but epidemiologists would want a different set of

requirements. Planning and development of the system should involve all stakeholders, as follows:

- consumers, including representatives of women's networks, women's health groups and all minority groups (immigrants, natives, visible and ethnic minorities and the disabled)

- professional colleges and associations

- cancer societies/provincial agencies

- government, including representatives from public health units, women's health agencies, and provincial and federal health promotion agencies

- research communities, including epidemiologists and academic researchers in health care and public policy

The process of developing an information system should reflect the needs of diverse interest groups; therefore, the Workshop Group recommends:

Recommendation 17. There should be consultation with all appropriate interests before establishing information systems. The design of information systems should be a result of participatory planning involving all the stakeholders.

Policy issues and use of data

How the information is used is of as much concern as the design of the systems. Extensive consultation is necessary to ensure protection of personal privacy, adherence to freedom of information legislation and development of appropriate protocols for using aggregated data. Other policy issues will also arise and require similar consultation and review. Therefore, the Workshop Group recommends the following:

Recommendation 18. Before the system is made operational, all stakeholders should be consulted on policy about access to data and the conditions under which identified data can be released. The use of information systems should be compatible with the database requirements in the province.

Components of information systems

Information systems to support health programs usually contain common elements: a registration file, a laboratory test database, data linkage capabilities (e.g., for linkage to cancer registries and vital statistics systems), and mechanisms for monitoring and evaluation. Although the elements of the database in similar programs in different jurisdictions often have common features, opportunities to improve program evaluation and delivery may be lost if definitions and standards are not coordinated. The Workshop Group

recommends the following:

Recommendation 19. Agreement on the core data to be included in information systems should be sought among all jurisdictions.

However, should consultation not result in early agreement, the delay should not be allowed to impede implementation of provincial systems.

Conclusions

As part of the process of consultation recommended in this report, a range of information management issues will be addressed. This report does not include explicit recommendations on such topics as ethical issues, use of smart-card technology, and the nature and control of access for research purposes, but the consultative, policy and planning process advocated should provide the mechanism for addressing them.

Well-designed and monitored information systems can enhance the benefits of an organized nationwide screening program. They can help to ensure quality control by linking testing and treatment with outcomes, increase efficiency, identify overscreening and support program evaluation. They can also help in answering research questions. These and other results can be used to improve the program.

A supporting laboratory network

High-quality laboratory services for reading cytology smears, with quality control systems. are an absolute requirement for an effective program.

Processing the smear

Once received in the laboratory, the slide and requisition should be given a unique accession number, and appropriate information should be recorded in a day book, card file or computerized file. This accession process must be performed accurately, the correct accession number being placed on both the slide and the requisition to avoid mixing up slides from different patients. The slides are stained with one of the many variations of the Papanicolaou staining technique and then cover-slipped to protect the smear.

Screening and interpretation

Skill, consistency and integrity of the cytotechnologists — the key people in any cytology laboratory — are absolute prerequisites for a successful screening program. Cytotechnologists should be trained in approved schools accredited by the Canadian Medical Association's Conjoint Committee for the Accreditation of Educational Programs in Cytotechnology. In Canada these schools are required to follow the guidelines of the Canadian Society of Laboratory Technologists (CSLT). The minimal acceptable

qualification for a cytotechnologist is certification in cytology by the CSLT or an equivalent qualification from the American Society of Cytology or the International Academy of Cytology. The Workshop Group recommends the following:

Recommendation 20. Cytotechnologists should be trained according to the requirements of the Canadian Medical Association's Conjoint Committee for Accreditation of Educational Programs in Cytotechnology, or their equivalent as recognized by the Canadian Society of Laboratory Technologists.

Optimal laboratory and cytotechnology workload

The number of smears that can be safely screened by cytotechnologists varies inversely with the number of other duties they must perform. For example, in a small laboratory cytotechnologists may perform all the tasks — accessioning cases, staining and mounting slides, and screening smears; in larger laboratories, clerical and auxiliary lab staff may perform all these duties except screening, leaving the cytotechnologists free to screen smears. The American Society of Cytology recommends that "the average cytotechnologist screen 20 000 gynecologic slides per year,"[30] a maximum figure that applies to cytoscreeners who perform no other duties. In 1990 new legislation in the United States made it likely that 80 to 100 slides will be considered the maximum number that can be screened by a cytotechnologist in 1 day.

In a laboratory that screens 50 000 to 100 000 or more smears per year, efficiency and proficiency may be enhanced with a hierarchical system of screening in which less experienced screeners pass smears with abnormalities beyond a defined range on to more experienced screeners. In the British Columbia laboratory, which screens more than 600 000 smears annually, technologists examine at most 85 to 90 slides daily. Accordingly, as recommended by the reconvened task force,[3] the Workshop Group recommends the following:

Recommendation 21. For most efficient function in a mass screening program, a laboratory should process a sufficient number of cases annually to require staffing by a minimum of three qualified and experienced full-time cytotechnologists, supervised by a cytopathologist, plus adequate clerical and technical support staff.

Although this recommendation is aimed at achieving maximum efficiency, proficiency must also be considered. Many laboratories with a small staff and few cases can perform reliably, but competence would not likely be maintained if a laboratory were seeing few cases of abnormal cytology annually.

The task force[2] addressed the problem of central or regional versus multiple laboratories. In Canada the distribution of laboratories processing cervical cytology specimens and the number of specimens vary considerably; the reasons for this were discussed fully in the

1976 report.[2] The Working Group believes that there is still a great need for the regionalization or centralization of cervical cytology services based on Canadian demographic and geographic considerations wherever there are multiple laboratories not fulfilling the criteria outlined above. We believe that the organization of laboratories may fall under the jurisdiction of the provincial government, the provincial cancer control program or the private medical system, this responsibility varying from province to province. The Workshop Group recommends the following:

Recommendation 22. Provincial governments should recognize the need for centralization or regionalization of cervical cytology screening services wherever there are multiple laboratories not fulfilling the criteria set out in recommendation 21.

Training of pathologists

As the task force[2] stated, pathologists planning to devote most of their career to cytopathology require 6 to 12 months' specialized postgraduate training. Any government wishing to upgrade a cervical cytology screening program should be prepared to fund sufficient cytopathology fellowships in the major teaching laboratories participating in the program to ensure satisfactory training and supervision. Because most general and anatomic pathologists will be expected to report on materials arising from cytology screening programs, all general and anatomic pathology residents should have a minimum of 3 months' exposure to basic diagnostic cytology.

Quality assurance programs

Quality assurance in cytopathology is essential in screening programs to reduce mortality from cervical carcinoma. In June 1989 the Canadian Society of Cytology approved revised guidelines for quality assurance programs in cytopathology (Appendix 3). The Working Group endorses these recommended minimal standards. The laboratory director is responsible for internal quality control within cytopathology laboratories. The appropriate professional medical association, with accrediting and licensing bodies, is responsible for external quality control. Because quality control is important in ensuring the effectiveness of cervical cytology screening programs, the Workshop Group recommends the following:

Recommendation 23. The jurisdiction responsible for cervical cytology screening programs should ensure that appropriate and satisfactorily functioning quality control mechanisms are in place.

Monitoring and evaluating the program

Evaluation of screening programs should be based on the principles that evaluation should reflect program objectives, nomenclature, procedures and measurements to facilitate evaluation should be standardized; and programs should facilitate relevant research.

The general objective of cervical cytology screening programs is to reduce the incidence of and mortality from cervical cancer. Specific objectives to achieve this goal are to promote awareness of risk factors, their control and relation to recommendations for screening; to provide accessible and acceptable screening services; to recruit eligible women, ensuring that those at high risk are screened; to ensure adherence to recommended screening schedules; to ensure that the taking and reading of smears are of high quality; to communicate results effectively; to follow up abnormal smears appropriately; and to provide efficient and effective services.

The components of program evaluation should be designed to reflect these objectives. They should include population-based information systems; internal and external quality control systems; and specific surveys of eligible and, especially, high-risk women to determine their awareness of the need for screening, how they practise screening and what advice their physicians give. Specialty designed epidemiologic studies - the case-control type is the most economical - can also be used for program evaluation, but generally should be part of a specific peer-reviewed research project.

The data requirements for efficient program evaluation include the following:

- mortality from cancer of the cervix

- incidence of invasive cancer of the cervix

- a register of all smears, identifying whether they are first or repeat smears (these records must be able to be linked to provide a longitudinal screening history of each woman and require capturing information on all changes of name; unique personal identifying numbers are preferred)

- a separate register of all abnormal smears, with data on follow up, management and outcome

- a record of all precancerous diagnosed lesions, classified according to the recommended terminology

- a record of all invasive cancers diagnosed, classified by stage

- information on cost and manpower items relevant to every aspect of screening

We emphasize that, to evaluate and monitor the program, the data in the information systems must be maintained in individually identifiable and linkable form, and the system should be accessible as well as functional. Population information should include age, geographic area, laboratory and the name of the woman's physician to identify women who are not being screened, are likely to be at highest risk and for whom special efforts will be needed to bring

them into the program. Such linkages will facilitate assessment of the success of measures taken to recruit such women.

The criteria for success or failure of screening programs are related to the program objectives: increase in awareness of the need for screening in the at-risk population; an increase in participation rates for screening; reaching women who have never been screened; improvement of the performance of laboratories; and reduction in unnecessary medical procedures and incidence and mortality of the disease. Evaluation should include not only outcome measures - most important, incidence and mortality from cervical cancer - but also process measures, so that if a program is effective in one region but not another, comparisons between them will identify the corrective actions needed.

Some designated authority is needed to accept responsibility for program evaluation, assess the success in achieving the program objectives and ensure implementation of corrective action. Although this may vary from province to province, the primary responsibility rests at the provincial level and should be assumed by government; however, government may seek the assistance of nongovernment organizations in reaching the objectives. Ideally, government should appoint a broad-based advisory committee comprising experts from diverse disciplines. Acting on the advice of this committee, governments may be able to delegate the responsibility for any necessary corrective action to those organizations responsible for different program components.

In this light, the Workshop Group recommends the following:

Recommendation 24. The jurisdictions responsible for cervical cytology screening programs should ensure that the mechanisms described in this report are in place to evaluate and monitor the total program, which should be overseen by a broad-based advisory committee established by each province.

Additional experience or research may modify some of our recommendations, particularly the ones differing from those of the federal task forces.[2,3] The Workshop Group therefore makes the following recommendation:

Recommendation 25. When new data on duration of protection from negative smears at ages 60 to 69 are available the recommendation to continue screening to age 69 should be reconsidered.

Relationship to other programs

Women's health in general

It was outside the Workshop Group's mandate to consider screening for cervical cancer in the context of all factors affecting women's health, be they socioeconomic, sexual or related to participation as a consumer in the health care system. However, in the context of primary

care and screening for disease, the Workshop Group considers screening for cervical cancer as one component of total health care, which has been considered by the Task Force on the Periodic Health Examination.[31] Although this program requires special expertise in taking smears, it is more readily integrated into health care because it does not require referral from the woman's primary care physician to another facility unless an abnormality is detected. Furthermore, it justifies priority consideration because most deaths from cancer of the cervix can be regarded as fully preventable.

Other screening programs

As the Task Force on the Periodic Health Examination[31] emphasized, whether screening for cervical cancer is directly combined with other screening procedures depends on the validity and effectiveness of each procedure. A pelvic examination may be included in the clinical examination accompanying taking of the cervical smear. One argument used to justify annual smears is the desire that women have annual pelvic examinations; while doing this, surely it is reasonable to take a smear. This argument is fallacious. There is no evidence that pelvic examinations will lead to earlier detection of other gynecologic cancers. Furthermore, they cannot be used as an argument for doing other screening tests.[2] Good screening tests are being sought for endometrial and ovarian cancer but are not yet available. The pelvic examination is not a screening test.

There is some merit in organizing a screening program for cervical cancer in association with the organization of other screening tests, most specifically those for breast cancer. To the extent that current recommendations on screening for breast cancer suggest that women age 50 to 69 receive letters of invitation to be screened,[6] this mechanism may be readily modifiable to ensure that women in an age group not well screened for cervical cancer should be reminded to be screened for this condition as well. One possible difficulty is the difference in the frequency of rescreening - biennially for breast cancer and triennially for cervical cancer. It may be counterproductive to invite women to be screened for both cancers together, because screening for breast cancer involves attending special centres, whereas screening for cervical cancer requires that the woman visit her family physician or gynecologist. Nevertheless, the population register could be used for organizing both programs, especially if the register is expanded to include women aged 18 to 49.

Economic aspects

The estimated cost of cervical cancer screening is about $10 per smear (although the cost would increase to $45 if the fee for the associated office visit were included). However, the cost of taking the smear varies considerably from province to province. Cervical cytology smears are listed in provincial medical care plans either as separate items or as part of the fee for a general examination.

Additional costs must be considered when setting up an organized program, as follows: the

need for quality control, evaluation and monitoring of the program, centralization of cytology services, establishment of an appropriate information system, and financing of public and professional education programs.

The incidence of cervical cancer has more than halved since screening was introduced, and, although perhaps partly due to factors other than screening, it is appropriate to assume roughly that the lifetime risk for cervical cancer in the absence of screening might be double the present risk of 1%. Over 8 million women in Canada are between the ages of 20 and 69; many at high risk for the disease are not screened, whereas many women are screened annually. A study in Manitoba showed that women screened annually represent about 40% of the eligible women in the population, about 90% of whom have been screened at least once.[32] Furthermore, 1.214 million smears were read in Ontario in 1987 at a cost of almost $13 million for the reading alone. Of these, 57% were taken in women under the age of 34 (EA Clarke: personal communication, 1990). This suggests that in Ontario most eligible women under the age of 34 were screened in 1987. For women over the age of 34, if it is assumed that most smears were taken from women under the age of 60, about 40% were screened - twice the proportion that would be expected if the recommendations of the task forces[2,3] were followed. Many of the older women in this group are still being screened annually, whereas many high-risk women - the more elderly, the poorly educated and those with low incomes - are not being screened at all. The Workshop Group's recommendations to establish organized programs with integral information systems are designed to ensure more relevant screening every 3 years and less annual screening. The costs of the information system are not known, but if the recommended changes resulted in 85% of women being screened every 3 years, of which 10% to 15% would require a repeat smear at 6 months, only 10% being screened annually and 5% remaining unscreened, there could be a laboratory cost saving alone of about $20 million annually across Canada plus a reduction in the cost of invasive cases and deaths. These savings would, presumably, provide sufficient funds to finance the information system and other aspects of an organized program with savings left over.

Moving from less frequent to annual screening increases the marginal costs per year of life gained.[25] For example, the US Office of Technology Assessment has recentlv estimated that one-time screening at age 65 would cost $1666 per life-year gained." Screening every 5 years from age 65 would cost an additional $1453 per life-year gained, but screening every 3 years would cost $5956 per life-year gained more than screening every 5 years, and annual screening would cost $39 693 per life-year gained more than screening every 3 years. Changing to an organized system of cervical cancer screening and reducing the frequency of unnecessary rescreening can, therefore, be regarded as cost effective.

Little information is available about the expected reduction in incidence and mortality from a more efficient, organized system. Theoretically, full implementation of the proposed schedules should reduce the baseline incidence and mortality by 90%.14 Again, that baseline is not known, but it is reasonable to assume that it is about twice the current rate. There is a

potential for a further reduction of about 1200 invasive cancers and 300 deaths annually. However, the theoretical maximum will not be achieved because some women will always remain unscreened, some women will not be screened satisfactorily and some with smear abnormalities will somehow fail to be managed appropriately, and they are likely to be at higher risk than those who are screened regularly. If the practical maximum benefit is only 60%, then a further reduction of only 300 cases and 76 deaths annually could be expected. However, each province probably should be able to reduce its rates at least to those now prevalent in British Columbia. This translates into a further national reduction of at least 340 cases and 125 deaths annually.

Research needs

At various points in this report the Workshop Group has directly or indirectly noted needs for research. In this section we summarize the organizational aspects of cervical cancer screening requiring research to identify correct or most appropriate approaches. Also, HPV is a possible cause of cervical cancer; although it is currently a research issue, it has implications for screening and the management of women with abnormal smears.

Research into organizational aspects of screening programs

Research on health promotion is needed to 0 Obtain and document appropriate demographic and epidemiologic information to clarify the numbers, geographic location and other characteristics of the nonscreened female population.

- Study the characteristics of women who have died from cervical cancer to determine contributing factors. These studies probably should be collaborative across regions or provinces and should concentrate on factors that resulted in failure to screen or, if relevant, failure of the screening process.

- Survey women with the identified characteristics to determine the pertinent barriers to screening and the incentives that might improve participation in screening.

- Survey primary care physicians to determine impediments to including women in screening programs and possible mechanisms to overcome them.

- Test models that address the foregoing, using various delivery modes and providers.

- Incorporate concepts of cervical cancer prevention and screening into general public education programs.

Research in support of planning is required on 0 Strategies to assess and modify screening behaviour, particularly to ensure that women attend for screening at appropriate intervals (special needs for those aged 40 or older).

- Measurement of the validity and reliability of the cervical cytology screening test under real world conditions.

- Cost-effectiveness of the various elements of organized cervical cytology screening programs, including recruitment of eligible women and follow up of abnormal smears.

- Local and regional demonstration projects for developing database programs for cervical cancer control that will address local program priorities and resource needs.

Research into natural history is needed to * Identify markers that would characterize women in terms of their long-term risk of invasive cancer.

- Obtain data to clarify the long-term prognosis of women with mild cytologic dysplasia.

- Characterize the prognosis of those with more severe abnormalities.

- Identify a marker for the necessary etiologic agent for cervical cancer, especially to clarify whether markers of infection with oncogenic HPV types will fulfil this role.

- Determine more precisely the risk of invasive cancer in women with previously negative smears who have reached the age of 60, especially women with two or more negative smears.

HPVs and cervical cancer

HPV infections of the cervix have become an increasing public health concern. Mounting evidence suggests that these infections contribute to the development of cervical cancer and, perhaps, other genital cancers. However, the impact of the findings on the prevention of and screening for cervical cancer still requires research.

Animal and experimental studies provide the strongest evidence, suggesting that certain HPV types, including HPV 6, 11, 16, 18, 31, 33 and 35, play a role in the occurrence of some intraepithelial lesions and some cervical cancers.[33] HPVs have been shown to be associated with the occurrence of squamous tumours in animals.[34] HPV deoxyribonucleic acid (DNA) is found in cell lines established from cervical cancers, and most of these cell lines contain either HPV 16 or 18 DNA that is integrated into the host cell genome.[33] Experimentally, HPV 16 DNA is capable of immortalizing keratinocytes in vitro and can induce malignant transformation in rodent cell.[33] Cervical intraepithelial lesions and cervical cancer can contain HPV DNA.[33] HPV 6 and 11 are detected more frequently in mild dysplasia, whereas HPV types 16 and 18 are the dominant types in severe dysplasia and invasive cancers.[33] HPV sequences have been found in most invasive cervical cancers.[33] In a number of case series, HPV DNA has been found more frequently in cervical cancers than

in normal specimens.[33]

There are few epidemiologic studies of HPV infection and risk of cervical cancer in human populations. A case-control study of invasive cervical cancers in Latin America revealed a significant increased risk of cervical cancer among women with HPV 16 or 18 infection after adjusting for other known risk factors for the disease,[35] although the prevalence of HPV was lower in the regions of Panama at highest risk of cervical cancer. A prevalence survey in two areas of Brazil revealed no evidence of shared risk factors for genital HPV infection and cervical cancer.[36] Studies in Greenland and Denmark found no evidence of higher HPV infection rates in Greenland,[37] even though the incidence of cervical cancer is higher there. In contrast, there was evidence of higher infection rates with herpesvirus type 2 in Greenland and a higher prevalence of risk factors for the disease associated with sexual activity.[38] Women with many sexual partners were at significantly lower risk for all types of HPV than women with few partners.[39]

Information on the natural history of HPV infections in human populations is very scant. We lack information on the occurrence of HPV infection among healthy women and the incidence of intraepithelial lesions or cervical cancer among infected women. One Canadian series, however, suggests that mild to moderate cervical dysplasia associated with HPV infection eventually disappears spontaneously or, at worst, lingers over many months in a mild to moderate form .[40] Therefore, the significance of an HPV infection remains unclear, because information so far does not preclude its being a "passenger" virus.41

If the link between HPV and cervical cancer is confirmed, the number of women potentially needing detection and treatment may be large. The prevalence of HPV infections in apparently healthy populations of women has varied according to whether epithelial abnormalities were present and to the assay used to detect viral DNA. There are no data on the prevalence of HPV cervical infections among Canadian women. Among relatively large groups of women in West Germany, Greenland, Denmark and Latin America the prevalence of cervical infection with HPV 6 or 11 11 varied from 2% to 7.5% and the prevalence of HPV 16 or 18 infections from 2% to 32%.[33,35-39]

In light of its review, the Workshop Group concluded that available information does not support using tests for HPV as part of screening for cervical cancer. The Workshop Group recommends the following:

Recommendation 26. Current evidence is not sufficient to support the use, in screening for cervical cancer, of laboratory procedures designed to detect specifically the presence of HPV.

Conclusion

Cervical cancer screening programs in Canada are not as effective as they could be, compared with the effectiveness achieved in some organized Nordic programs. Although the Canadian tradition of physician-based practice may not be as amenable to organization, many basic requisites for an organized system exist in Canada, and government and other circles are increasingly willing to accept the necessity for this. The Workshop Group's recommendations have been directed to this end.

However, the Workshop Group emphasizes that its recommendations should be considered as a whole. In particular, the recommended screening frequencies should be established as formal policy only when high-quality laboratory services for reading cytology smears with quality control systems are established, and, preferably, when there are information systems to monitor the frequencies and to issue reminders to women to attend at the recommended intervals.

In the absence of the organized system for cervical cancer screening recommended in this report, and to ensure that as many women as possible throughout Canada are offered the protection of regular cervical cytology screening, physicians should ensure that cervical cytology smears are taken soon after the age of 18 or once women are sexually active, that the smear is repeated after 11 year, and, provided the smears are of appropriate quality and normal, that the process is repeated at least every 3 years until the woman reaches 70. It is especially important that women who no longer see physicians for maternal or child care are included in a program of regular cervical cytology screening, because most cases of the disease are now occurring in this group.

It has been necessary to review Canadian programs for screening for cervical cancer every 6 or 7 years. The Workshop Group recommends the following:

Recommendation 27. No later than 1996 all programs should be reviewed further for the Conference of Deputy Ministers of Health, using data obtained through the evaluation and monitoring functions of the recommended information systems.

References

1. Hakama M, Chamberlain J, Day NE et al: Evaluation of screening programs for gynecological cancer. Br J Cancer 1985;52:669-673

2. Task Force on Cervical Cancer Screening Programs: Cervical cancer screening programs. Can Med Assoc J 1976; 114: 1003-1033

3. Idem: Cervical Cancer Screening Programs 1982, Health Services and Promotion Branch, Dept of National Health and Welfare, Ottawa, 1982

4. National Cancer Institute of Canada: Canadian Cancer Statistics 1990, National Cancer Institute of Canada, Toronto, 1990

5. Fink DJ: Change in American Cancer Society checkup guidelines for detection of cervical cancer. CA 1988, 38: 127

6. The Workshop Group: Reducing deaths from breast cancer in Canada. Can Med Assoc J 1989; 141: 199-201

7. Kinlen LJ, Spriggs Al: Women with positive cervical smears but without surgical intervention. Lancet 1978; 2: 463-465

8. Boyes DA, Morrison B, Knox EG et al: A cohort study of cervical cancer screening in British Columbia. Clin Invest Med 1982; 5: 1-29

9. Coppleson LW, Brown B: Observations on a model of the biology of carcinoma of the cervix: a poor fit between observation and theory. Am J Obstet Gynecol 1975; 122: 127136

10. Miller AB, Knight J, Narod S: The natural history of cancer of the cervix, and the implications for screening policy. In Miller AB, Chamberlain J, Day NE et al (eds): Cancer Screening, Cambridge U Pr, Cambridge, UK, 1991; 141-152

11. Knight JA: Screening for Cervical Cancer.- A Cohort Study in British Columbia. MSc thesis, University of Toronto, Toronto, 1989

12. Cramer DW: The role of cervical cytology in the declining morbidity and mortality of cervical cancer. Cancer 1974; 34: 2018-2027

13. Miller AB, Lindsay J, Hill GB: Mortality from cancer of the uterus in Canada and its relationship to screening for cancer of the cervix. Int J Cancer 1976; 17: 602-612

14. Hakama M: Trends in the incidence of cervical cancer in the Nordic countries. In Magnus K (ed): Trends in Cancer Incidence.- Causes and Practical Implication, Hemisphere Pub, Washington, 1982: 279-292

15. Laara E, Day NE, Hakama M: Trends in mortality from cervical cancer in the Nordic countries: association with organized screening programs. Lancet 1987; 1: 1247-1249

16. Cook GA, Draper GJ: Trends in cervical cancer and carcinoma in situ in Great Britain. Br J Cancer 1984; 50: 367-375

17. Parkin DM, Nguyen-Dinh X, Day NE: The impact of screening on the incidence of cervical cancer in England and Wales. Br J Obstet Cynaecol 1985, 92: 150-157

18. Clarke EA, Anderson TW: Does screening by "Pap" smears help prevent cervical cancer? Lancet 1979; 2: 1-4

19. Aristizabal N, Cuello C, Correa P et al: The impact of vaginal cytology on cervical cancer risks in Cali, Colombia. lnt J Cancer 1984, 34: 5-9

20. La Vecchia C, Francheschi S, DeCarli A et al: "Pap" smear and the risk of cervical neoplasia: quantitative estimates from a case-control study. Lancet 1984; 2: 779-782

21. MacGregor JE, Moss SM, Parkin DM et al: A case-control study of cervical cancer screening in northeast Scotland. BMJ 1985;290:1543-1546

22. Berrino F, Gatta G, D'Alto M et al: Efficacy of screening in preventing invasive cervical cancer: a case-control study in Milan, Italy. In Hakama M, Miller AB, Day NE (eds): Screening for Cancer of the Uterine (cervix (IARC sci pub no 76), International Agency for Research on Cancer, Lyon, 1986:111-123

23. Van der Graaf Y, Zielhuis GA, Peer PGM et al: The effectiveness of cervical screening: a population-based case control study. J Clin Epidemiol 1988-, 41: 21-26

24. [ARC Working Group on Cervical Cancer Screening: Summary chapter. In Hakama M, Miller AB, Day NE (eds): Screening for Cancer of the Uterine (cervix (IARC sci pub no 76), International Agency for Research on Cancer, Lyon, 1986:133-142

25. Muller C, Mandelblatt J. Schechter CB et al: Costs and Effectiveness of Cervical Cancer Screening in Elderly Women - Background Paper (OTA-BP-H-65), US Congress, Office of Technology Assessment, Washington, 1990

26. Eddy DM: The frequency of cervical cancer screening: comparison of a mathematical model with empirical data. Cancer 1987;60:1117-1122

27. Thompson DW: Adequate "Pap" Smears: a Guide for Sampling Techniques in Screening for Abnormalities of 'the Uterine (cervix, Laboratory Proficiency Testing Program, Toronto, 1989

28. National Cancer Institute Workshop: The 1988 Bethesda system for reporting cervical/vaginal cytological diagnoses. JAMA 1989; 262: 931-934

29. Carmichael JA , Jeffrey JF, Steele HD et al: The cytological history of 245 patients developing invasive cervical carcinoma. Am J Obstel Gynecol 1984; 148: 685-690

30. Ashton PA: American Society for Cytotechnology Quality Assurance survey data: summary report. Acta Cytol 1989; 33: 451-454

31. Task Force on the Periodic Health Examination: The periodic health examination. Can Med Assoc J 1979; 121: 1193-1254

32. Cohen MM, Hammarstrand KH: Papanicolaou test coverage without a cytology registry. Am J Fpidemiol 1989; 129: 388394

33. Koutsky LA, Galloway DA, Holmes KK: Epidemiology of genital human papillomavirus infection. Epidemiol Rev 1988, 10: 122-163

34. Gissmann L: Papillomaviruses and their association with cancer in animals and in man. Cancer Surv 1984; 3: 161-181

35. Reeves WC, Brinton LA, Garcia M et al: Human papillomavirus infection and cervical cancer in Latin America. N Engl J Med 1989; 320: 1437-1441

36. Villa LL, Franco ELF, Ludwig Institute for Cancer Research Human Papillomavirus Study Group: Epidemiologic correlates of cervical neoplasia and risk of human papillomavirus infection in asymptomatic women in Brazil. J Natl Cancer Inst 1989; 81: 332-340

37. Kjaer SK, De Villiers EM, Haugaard BJ et al: Human papillomavirus, herpes simplex virus and cervical cancer incidence in Greenland and Denmark: a population-based cross-sectional study. Int J Cancer 1988; 41: 518-524

38. Kjaer SK, Teisen C, Haugaard BJ et al: Risk factors for cervical cancer in Greenland and Denmark: a population based cross-sectional study. Int J Cancer 1989; 44: 40-47

39. Kjaer SK, Engholm G, Teisen C et al: Risk factors for cervical human papillomavirus and herpes simplex infections in Greenland and Denmark: a population-based study. Am J Epidemiol 1990; 131: 669-682

40. Carmichael JA, Maskers P.D.: Cervical dysplasia and human papillomavirus. Am J Obstel Gynecol 1989; 160: 916-918

41. Kjaer SK, Poll P, Jensen H et al: Abnormal Papanicolaou smear: a population-based study of risk factors in Greenlandic and Danish women. Acta Obstel Gynecol Scand 1990; 69: 79-86

Appendix 1: Reporting terminology for cervicovaginal cytology

Unsatisfactory (reason to be stated)

No abnormal cells

Metaplasia noted

Abnormal cells consistent with benign atypia (non-dysplastic)

Inflammatory effect

Trichomonas effect

Viral effect

Yeast effect

Irradiation effect

Keratinization

Atypical metaplasia

Other

Abnormal cells consistent with condyloma (HPV)

effects

Abnormal cells consistent with dysplasia Mild dysplasia (CINII)

Moderate dysplasia (CIN II)

Severe dysplasia (CIN III)

Abnormal cells consistent with malignancy

Consistent with in-situ squamous carcinoma

(CIN III)

Consistent with invasive squamous carcinoma Consistent with adenocarcinoma

Type unspecified

Atypical cells not specifically classified, regarded as a significant epithelial abnormality (comments to be attached)

Appendix 2: Goals and objectives of information systems

The goals of an information system are as

follows.

To enrol the at-risk population: for a cervical cancer screening program it is essential that the database incorporate the information on the entire target population, including the previously unscreened.

To maintain information: information on the screening history of each woman must be maintained in the database; in addition, information must be organized and the data elements defined to facilitate analysis and planning.

- To provide follow up: the information system must support communication with individuals concerning test results and the need for screening, rescreening or medical follow up.

- To support quality assurance: design of the information system must incorporate the capacity for qualitative assessment of the program as a whole.

- To track utilization: a critical measure of the value of the program's information system will be its ability to follow patterns of use to determine levels of both underscreening and overuse.

- To monitor compliance: compliance with recommended screening and appropriate follow up must be monitored by the information system to help evaluate the success of the overall program as well as targeted outreach programs.

The information systems developed to support the proposed cervical cancer screening program must be designed to meet the following objectives.

- Locate the unscreened and underscreened.

- Provide data to help programs reach targeted groups such as immigrant and native women.

    - Record detected abnormalities.

    - Assist in follow up and treatment.

    - Reduce overscreening.

    - Provide reference data to cytopathologists.

- Assist in follow-up communications to the target population.

    - Support a schedule of testing.

- Evaluate compliance.

- Define high-risk groups.

- Facilitate evaluation and planning.

- Determine the cost effectiveness of the screening program.

Appendix 3: Guidelines for quality assurance programs in cytopathology

Reproduced from the Canadian Society of Cytology Bulletin 1989,5 (2): 1-21, with permission. Revised and approved on Feb. 18, 1989, by the Executive Committee.- Dr. Michael Lipa (Chairman), Dr. Allen Fletcher, Dr. Vicky Chen, Dr. G Khanh Nguyen,

Dr. Terry Colgan, Dr. John Magown, Dr. Maria Paraskevas, Mr. J Redburn

These are minimal guidelines recommended for quality assurance programs in cytopathology and may be enhanced to satisfy the requirements of individual cytology laboratories. These guidelines may be reviewed and updated from time to time as required.

1.0.0 Introduction

1.1.0 This is a revision of the original Guidelines For the Establishment of Quality Assurance Programs in Cytopathology which was prepared by the Quality Control Committee of the Canadian Society of Cytology and introduced June, 1978.

1.2.0 Cytopathology is the practice of medicine specializing in patient diagnosis and management through the evaluation of cytologic (cellular) manifestations of disease.

1.3.0 Cytology has been subdivided into "gynecological" and "non-gynecological." The former usually related to the evaluation of cervical-vaginal cell smears while the latter tended to include all other types of cytology including examinations from other regions of the female genital organs. "Gynecological cytology" herein is termed cytology, cervical-vaginal and "non-gynecological cytology" is termed cytology, other than cervical-vaginal. The basic principles of cytopathology apply to both and to either when subdivided.

1.4.0 Quality performance should produce a clinically useful patient result. This quality includes accuracy, precision and an adequate turn-around time to assure that further clinical management [is] appropriate to the state of the patient material examined.

1.5.0 Practitioner in this guideline means a licensed medical or dental practitioner (physician or dentist).

2.0.0 Laboratory personnel

2.1.0 Laboratory director

The cytology laboratory should be under the direction of a legally qualified physician with specialist qualifications in pathology including special training and expertise in cytopathology. The director should serve the laboratory full time, or on a regular part time basis.

2.2.0 Associate cytopathologists

The basic qualifications are similar to those of the director.

2.3.0 Cytotechnologists

Cytotechnologists should meet one of the following requirements:

2.3.1 Persons with an R.T. (Cytology) awarded by the C.S.L.T. [Canadian Society of Laboratory Technologists] or the equivalent of this qualification.

2.3.2 Persons who have received six to twelve months' training in an approved school of cytotechnology followed by sufficient supervised hospital experience to meet the requirements of the C.S.L.T. or equivalent for eligibility for cytology certification may also be employed. Any employee in this category should become certified in cytology by the C.S.L.T. or equivalent within two years of completing training and certification eligibility.

2.3.3 Persons who prior to 1968 have completed at least 6 months' accumulated training in a laboratory acceptable to the C.S.L.T. and have subsequently engaged in cytotechnology practice, including screening under supervision for at least two years may also be acceptable.

2.4.0 Support personnel

Clerical and laboratory assistant functions can be performed by personnel whose qualifications appear appropriate to the laboratory director.

3.0.0 Physical facilities

3.1.0 Laboratory space

3.1.1 The laboratory should be clean, well lighted and properly ventilated. Appropriate services such as sinks, water, gas, suction and electrical outlets should be present as necessary.

3.1.2 The work areas should be functionally arranged so as to minimize problems in handling specimens, evaluation and reporting. There must be physical separation of the microscope screening and reporting area from the specimen handling (preparatory) portion of the laboratory so that universal precautions may be observed in the latter area, if fresh unfixed specimens are being handled.

3.1.3 Working conditions in the cytology laboratory should be conducive to high quality performance. The microscopy area should be quiet, orderly and of adequate size for the number of individuals employed.

3.2.0 Safety precautions

3.2.1 Precautions to protect employees from physical, chemical and biological hazards should be observed. These include the use of [a] fume hood for handling volatile and toxic substances and [a] biological safety cabinet for handling biohazardous material. Fire precautions should be known, posted and observed. An appropriate fire extinguisher should be readily available in the laboratory.

3.2.2 Universal precautions should be observed when handling blood and body fluids. [1] These precautions are designed to avoid the transmission to health care personnel of infectious agents such as Human Immunodeficiency Virus (HIV) and associated diseases such as Acquired Immune Deficiency Syndrome (AIDS). These recommendations may be updated from time to time.[2]

3.2.3 Hepatitis B vaccination is recommended for hepatitis B susceptible health-care workers handling unfixed body fluids or tissues.

3.2.4 Volatile and flammable liquids should be properly stored.

3.2.5 All electrical outlets should be properly installed and maintained.

3.3.0 Equipment

3.3.1 There must be an adequate number of binocular microscopes of high optical and mechanical quality.

3.3.2 There should be an active program of preventive maintenance with documentation for microscopes and all other items of equipment.

4.0.0 Specimen collection and preparation

4.1.0 Specimen collection

4.1.1 Specimens should be accepted and examined only if ordered by a licensed medical or dental practitioner and collected by a licensed physician, dentist, medical house staff member or by appropriate allied health care personnel.

4.1.2 The laboratory should provide written instructions regarding recommended collection techniques and ensure that these are available to those persons submitting specimens. When a specimen is unsatisfactory, the originator should be notified by the laboratory so that an adequate repeat specimen may be submitted. Proper specimen collection is an important initial step to assure optimal cytologic assessment.

4.2.0 Laboratory manual

4.2.1 Each area of the laboratory in which specimen preparation and staining are performed must have available a laboratory manual detailing the specific methodology required for the technique performed in this area. These manuals should be updated on a regular basis, dated and signed by the director of the laboratory.

4.3.0 Preparation and staining techniques

4.3.1 Specimens to be examined should be received properly labelled at the source of collection with the patient's name and should be accompanied by a corresponding properly completed requisition.

4.3.2 The specimen accession number should be recorded on each slide by permanent marking or label. The patient's name on each slide serves as an additional useful identifier.

4.3.3 The Papanicolaou staining technique or an acceptable alternative is recommended and the laboratory should carry out the preparation and staining of cytologic specimens in order to maintain a high level of technical quality.

4.3.4 All stock working solutions and stains should be dated at the time of preparation, or receipt if commercial prepared stains and solutions are used. All reagents and solutions should be labelled to indicate identity, titre, strength and concentration. Recommended storage requirements and expiration date and other pertinent information should also be documented.

4.3.5 Staining quality should be checked daily with appropriate correction of suboptimal results.

4.3.6 All cytotechnologists should be aware of the problem of cell transfer contamination and take adequate precautions to avoid this hazard. Suspected malignant effusions should be

stained separately.

4.3.7 All solutions should be filtered or replaced regularly to maintain potency and freedom from

contamination (especially following staining of positive body cavity fluids).

4.3.8 All staining solutions and mounting media should be kept covered when not in use.

4.3.9 Volumetric measuring equipment should be of such quality and maintained in such condition as to ensure accuracy and precision of results.

5.0.0 Cytoscreening and cytodiagnostic Practices

5.1.0 Cytopathologists

5.1.1 The laboratory director or designated medical professional personnel, similarly qualified in cytopathology, are responsible for the proper performance and reporting of all tests done in the laboratory.

5.1.2 The director or designated cytopathologist(s) should spend an adequate amount of time in the laboratory to direct the staff and should be ready for consultation.

5.1.3 The laboratory director or designated cytopathologist should review and report at least all abnormal cytology specimens and all specimens from patients in whom the clinical information or cytologic appearance warrant further assessment. (See 6.3.2 for definition of abnormal cytology, cervical-vaginal.)

5.2.0 Cytotechnologists

5.2.1 Slide screening workload.- cytology, cervical-vaginal: Neither economic considerations alone nor expediency must determine the number of cytology slides to be screened by a cytotechnologist in one day (24 hours). It is the responsibility of the laboratory director to assure that the number and type of cytology slides to be screened does not, through fatigue, affect adversely the cytotechnologist's ability to find, recognize and interpret correctly abnormal cells that may be representative of a disease process.

Precise workload limitation may be difficult to define because of variations in types of cytology specimens being screened as well as variations in support by screening personnel of graded responsibility in the laboratory. Some specimen slides may be easier and less fatiguing to screen while other specimen slides may be very difficult and very fatiguing to screen. The relative proportions of these

various types of slides should determine the total number of slides to be screened by a cytotechnologist in a working day. It may be feasible to cytoscreen a large number of "routine" cancer prevention screening type cervical-vaginal smears than smears in follow-up of a previously detected abnormality. The number of cervical-vaginal smear slides screened by a cytotechnologist exclusively screening full-time without other duties or distractions may vary from 60-80 cumulative for that individual in a working day (about 6-8 hours of screening).

A cytotechnologist whose other duties require that less total time is devoted to slide screening alone should have a proportionately reduced workload. For example a total of 4 hours exclusively devoted to slide screening, should require a prorated workload no greater than 4/8 x (60-80) = 30-40 slides to be screened. The director should determine when circumstances for adequate screening by a cytotechnologist require that lesser numbers of slides be screened in a daily time period.

Moreover a cytotechnologist must not be expected in a 24 hour time period to screen more than 90 slides even if they are "routine" type cervical-vaginal smears (on average about 10 slides per hour devoted exclusively to screening).

5.2.2 Slide screening workload.- cytology, other than cervical-vaginal: The number of slides of cytology, other than cervical-vaginal, screened in a similar time period may be proportionately lower depending on the complexity of the specimen.

5.2.3 Satisfactory slides: Each slide preparation should be evaluated to determine whether the material is satisfactory for diagnostic purposes and consistent with the stated site of origin. There should be adequate numbers of definable cells consistent with the clinically stated source. In addition cervical-vaginal smears for cervical cancer detection should exhibit components from the cervical-endocervical transformation zone. Cellular components from this region may be represented by endocervical columnar cells, squamous metaplastic cells or dysplastic cells.

5.2.4 Cytologic abnormalities should be dotted or otherwise appropriately marked to be adequately representative of the screened material. Interpretative notations should be made on appropriate working documents, along with identification of the screener(s) (see 6.2.4).

5.3.0 Cytologic terminology

5.3.1 Cytology, cervical-vaginal: The cytologic interpretation should be rendered according to the generally utilized reporting system of the province. It is recommended that where it is not currently in use, the widely accepted terminology outlined in the Reports of the Task Forces[3,4] should be adopted in principle.

5.3.2 [Appendix I replaces 5.3.2 guidelines]

5.3.3 Alternative terminologies: Some laboratories

in North America use CIN terminology. If using such terminology, the laboratory director should assure that the report includes an explanation of equivalence to the more widely accepted terminology specifying "degrees of dysplasia" [see Appendix II. The obsolete numbered "class" system of reporting should not be used.

5.3.4 Cytology, other than cervical-vaginal: Cytologic reporting should, wherever feasible, conform and correspond to equivalent terminology currently used in diagnostic reporting in histopathology (example: World Health Organization [WHO] tumour classification in current use).

5.4.0 "Turn around time.-" The time elapsed from the taking of the specimen from the patient until the cytopathology report is communicated to the practitioner caring for the patient should be as short as feasible in order to facilitate appropriate further management by the patient's practitioner.

5.5.0 Screening and reporting on site.- All slides should be prepared, examined and reported on the premises of a laboratory and preferably stored with their records on site to facilitate retrieval.

6.0.0 Requisitions, reports and records

6.1.0 Requisition form: The information required includes the following:

a) laboratory accession number

b) patient names as required for proper identification

c) medical plan and number, address and hospital admission number

d) date of birth (including day, month and year)

e) name of referring physician or dentist

f) anatomic site of specimen, appropriate medical history including previous therapy

g) date of specimen collection

h) date and time specimen received in laboratory

i) date of report of cytopathologic interpretation

6.2.0 Report form

6.2.1 If the report form is separate from the requisition form, it should include all information as on the requisition form (see 6. 1.0), plus the date of the report.

6.2.2 If the specimen is unsatisfactory, this should be stated and explained with recommendations where appropriate for the submission of an adequate specimen (see 5.2.3).

6.2.3 For cytology, cervical-vaginal, a diagnostic reporting system similar to that outlined in the "Waiton Report" is recommended [Appendix II. A preprinted check-off report form for cervical-vaginal cytology is convenient and allows consistent use of appropriate terminology. For patients found to have a significant cytologic abnormality, an interpretative report is recommended. This report should be made by the laboratory director or associate cytopathologist, together with any comments or recommendations regarding further management. For cytology, other than cervical-vaginal, a reporting system should produce a clear communication using interpretive terminology similar to good surgical pathology reporting using current classifications appropriate to the tissue source of the specimen. Specimens considered to be unsatisfactory or unrepresentative of the stated tissue site should result in a report that indicates such concern.

6.2.4 Each file copy should bear the identification of the cytotechnologist(s) and cytopathologist(s) who screened and reported the cytology preparation.

6.3.0 Laboratory records

6.3.1 Accession log.- Each specimen received should be recorded in a daily log in which the patient's name and sequential accession number are entered, together with the name of the referring physician, hospital or clinic, and the type of specimen.

6.3.2 Slide file.- The laboratory should retain all cytology slides and cell blocks for a minimum of five years or as otherwise currently recommended. All abnormal reports, slides and cell blocks in which possible or definite malignancy or dysplasia is seen, should be retained for a minimum of twenty years or as otherwise currently recommended or regulated. The twenty year retention period is also recommended for slides reported as abnormalities consistent with irradiation effects, viral effects (herpes and HPV), condyloma effects, atypical squamous metaplasia and atypical hyperplasia of endocervical cells. It is recommended that a separate file of slides from abnormal cases be established in the laboratory. There should be an adequate retrieval system for all slides.

6.3.3 Report file: Reports should be easily retrieved. Laboratories should retain all reports (as for slides above) for a minimum of five years or as otherwise currently recommended or regulated and all abnormal reports should be retained for at least twenty years or as required by local laws. It is recommended that a separation or "flagging" of such abnormal reports be

established in the laboratory.

6.3.4 Personnel file: Up-to-date records should be maintained on all personnel as follows:

a) the director of the laboratory, with qualifications, experience and continuing education in cytology

b) associate cytopathologists, with qualifications, experience and continuing education in cytology

c) all cytotechnologists with education, certification, experience and continuing education in cytology

d) all other employees, with education and experience

e) health records on all persons working in the laboratory, as available

7.0.0 Quality assurance practices

Following adequate specimen collection and preservation, an important aspect of overall quality assurance in cytology is the control of the quality of slide preparation, screening and the interpretation of detected abnormalities. Guidelines must be adapted to a range of laboratory situations and with varied volumes of different types of specimens and varied cytotechnology and cytopathology personnel. Some facilities may be able to use computer technology to facilitate aspects of quality control. Quality assurance practices should be applied and should he documented on a continuing basis. Furthermore there should be continuing effort for development and improvement of quality assurance practices beyond what is outlined herein.

7.1.0 Cytology, cervical-vaginal: internal quality assurance

7.1.1 Review

a) Specimens which show a significant abnormality (dysplasia or greater) are referred for review by the original screener to a senior cytotechnologist and then, if appropriate, to a cytopathologist or directly to a cytopathologist if that is the usual practice. If the patient had previous negative cytology reported, these smears should also be re-examined at this time to evaluate any possibility of earlier false negative reporting.

b) All smears, both current and past, on a given patient should be reviewed by a cytopathologist when the referring practitioner describes a suspicious lesion.

c) A small proportion of slides from each batch prepared should be reviewed on a daily basis, for adequacy of preparation including fixation and staining.

7.1.2 Re-screening.- Re-screening of a proportion (usually about 10%) of apparently negative smears has been a widely practiced technique but its value in the detection of false negative screenings has been questioned and discredited. Any re-screening of negative slides should therefore be at the discretion of the laboratory director with consideration for the circumstances applying from time to time.

7.1.3 Follow-up program

a) All patients who are reported to have a significant abnormality should be followed up by the laboratory or other agency to whom this task may be delegated, to obtain final clinical or preferably tissue confirmation of the diagnosis (see 7.3. 1).

b) Statistical data should be maintained which would include the number of cases screened annually in each category, the origin of such cases and all corroborative follow-up data. Discrepancies, if any, should be included with this information.

7.1.4 Performance evaluation

a) Documented evaluation of each cytotechnologist's performance and workload should be maintained as part of the personnel records. A mechanism for taking corrective action should be included in the internal quality assurance program.

b) The technique of seeding the routine cervical-vaginal cytology screening material with known positive cases may be of value in assessing cytopathologist and cytotechnologist performance. This technique may not be practical in a smaller laboratory where screening may be combined with specimen preparation duties.

7.2.0 Cytology, cervical-vaginal: external quality assurance

Peer review: A review of both normal and abnormal smears exchanged between co-operating laboratories on a provincial or regional basis should be established wherever possible. These review smears should be handled as ordinary cases in that they are first screened by the cytotechnologist and then seen when appropriate by a cytopathologist for final diagnosis.

A program of this type is operating at the present time in . . . Ontario as the Laboratory Proficiency Testing Program [LPTP] of the Ontario Medical Association. In early 1988 Ontario LPTP announced willingness to make available to provincial cytology organizations or groups of provinces, a sharing of logistics and computer programming to

facilitate establishment of external proficiency testing in cytology in other provinces.

7.3.0 Cytology, other than cervical-vaginal

7.3.1 Internal quality assurance.- The quality control measures outlined for cytology, cervical-vaginal also apply generally to cytology, other than cervical-vaginal specimens. The cytology should be correlated with the histopathology of corresponding tissue biopsy or autopsy examination, recognizing that in some cases cytologic and histologic tissue sampling may be at variance requiring further follow-up to resolve what at first may appear to be a biopsy discrepancy. These correlations should be performed and documented on a continuing basis.

7.3.2 External quality assurance.- External quality assurance should be similar to that recommended for cytology, cervical-vaginal.

7.4.0 Compliance with relevant legislation: The laboratory should comply with all relevant federal, provincial and local legislation.

7.5.0 Ethics: The laboratory director and his [or her] associates should adhere to the ethical practice of the ... profession as laid down by the Canadian Medical Association and provincial licensing bodies.

8.0.0 Continuing education practices

8.1.0 The laboratory director is responsible for the employment of qualified laboratory personnel and for their in-service continuing education.

8.2.0 The laboratory director and/or associate staff should organize a regularly scheduled continuing education program for the benefit of staff members.

8.3.0 The cytotechnologist and cytopathologist should update his or her knowledge of current cytology practice by reading current relevant literature. Acta Cytologica and Diagnostic Cytopathology are two regularly published cytology journals and there are cytology atlases, general textbooks, and specialized books now available. Appropriate current texts and journals should be easily available on the premises of the laboratory.

8.4.0 Cytotechnologists should participate in and be responsible for components of continuing education by liaising with and working in conjunction with the laboratory director or similarly qualified professional staff.

8.5.0 Cytopathology and cytotechnology staff should participate in local and regional continuing education programs.

8.6.0 There should be adequate feedback to cytotechnologists with regard to case material and cytotechnologists should have ready access to the cytopathology staff to discuss this

material.

8.7.0 There should be continuing input from the Canadian Society of Cytology into training programs for cytopathologists and cytotechnologists

References

1. Recommendations for prevention of HIV transmission in health care settings. Can Dives Wily Rep 1987; 13S3 (Nov suppl)

2.Universal precautions. Can Dives Wily Rep 1988; 14 (July 9): 27

3.Task Force on Cervical Cancer Screening Programs: Cervical

cancer screening programs. Can Wed Assoc J 1976; 114: 1003-1033

4.Idem: Cervical Cancer Screening Programs 1982, Health Services and Promotion Branch, Dept of National Health and Welfare, Ottawa, 1982